

# **The MF-211 System: An LSI-11/2 Microprocessor**

*with double density dual floppy disks . . .*



*and complete RX02 software/media  
compatibility*

## **CROS**

CHARLES RIVER DATA SYSTEMS, INC.

Four Tech Circle, Natick, Massachusetts 01760, Telephone (617) 655-1800, TWX (710) 368-0523

# The MF-311 System An LSI-11's Microprocessor with double density dual floppy disks



and complete RXDS software  
compatibility

**RXDS**

FOR THE LSI-11, THE MF-311 IS THE ONLY SYSTEM THAT PROVIDES THE SAME SOFTWARE COMPATIBILITY AS THE LSI-11, BUT WITH THE ADVANTAGES OF A MICROPROCESSOR-BASED SYSTEM.



## DESCRIPTION

The MF-211 system combines DEC's LSI-11/2 with the dual-Shugart SA800 flexible disk drives, all within a 10½" rack mountable enclosure. The CRDS controller provides for dual density operation and complete software/media compatibility with DEC's RX02 floppy disk system. Functionally identical in operation to DEC's 11V03L, the MF-211 can be used in a variety of system applications utilizing any of the RX02 software packages, such as RT11, Fortran, Basic, Pascal, etc. The standard system uses DEC's H9270 4-quad slot backplane with an 8-quad slot backplane available as an option within the same 10½" enclosure!

### Each Standard MF-211 System Contains:

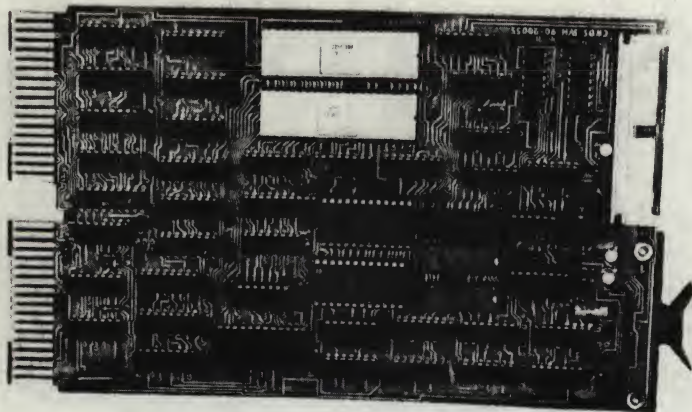
- KD11HA, DEC LSI-11/2 central processor
  - Dual floppy disk system using industry standard Shugart SA800 floppy disk drives having a combined capacity of one million bytes and built-in write-protect.
  - A dual-height controller containing all needed electronics for control functions, interface, bootstrap loader (eliminating need for DEC BDV-11AA card), formatter and self-tester; the controller is completely RX02 equivalent, including software and media compatible.
  - A 19" rack mountable enclosure having 10½" panel height and front panel switches for:
    - Enable/halt
    - Line time clock
    - Initialize/boot
- Also:
- Indicators for "Run" and "DC OK"
  - Removable front panel
  - Front access to all PC cards
  - Rack mountable slides
  - On-off circuit breaker
- Power supply with needed +5V and +12V power for 4-quad slot or 8-quad slot backplane. Includes options for 110V or 220V, 60Hz or 50 Hz.
  - 16K or 32K word MOS memory with self-contained refresh.

### Options Available With MF-211

- Any DEC system component for the LSI 11/2 micro-processor including:
  - KEV-11 Extended Arithmetic Unit
  - DLV-11 Serial Line Unit
  - DLV-11J Quad Serial Line Unit
  - Cables for DLV-11 & DLV-11J
  - DRV-11 Parallel Interface
  - KWV-11A Programmable Clock
- DEC software packages, such as:
  - RT11
  - Fortran/RT11
  - Basic/RT11
  - Multi-user Basic/RT11
  - Focal

### NOTE:

*Terminals for the MF-211, such as video terminals, printers, etc. can be obtained from DEC or local distributors. Terminals must have either RS232 interface or 20ma current loop interface.*



## CONTROLLER CARD

The MF-211 controller card is unique in many respects. It is the *only controller in the industry* which contains all controller, interface, bootstrap loader and formatter electronics on a single dual-height card. In addition, it provides complete software/media compatibility with the RX02 DEC floppy-disk system.



1. The following information is being furnished to you for your information and guidance. It is to be used for the purpose of the project and is not to be distributed outside the project without the express approval of the project manager.

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PRICE LIST

+7% surcharge.

MF-211 SYSTEM; LSI-11/2 WITH RX02 COMPATIBLE

DOUBLE DENSITY DUAL FLOPPY SYSTEM

MF-211 Includes:

LSI-11/2 DEC Microprocessor  
Dual Shugart SA800 Floppy Disk System  
for Double & Single Density Operation  
Floppy Disk Controller/Interface Card  
with Bootstrap, Self-Tester, Formatter &  
providing complete RX02 software & media  
compatibility with DEC software  
H9270 Four Quad Slot Backplane  
Enclosure with Front Panel Console,  
switches for Enable/Halt, Line Time Clock  
& Initialize, and indicator lights for  
"DC POWER" and "RUN"  
Power Supply

1-9

MF-211 With 16K Words	\$5,530.00
32K Words	\$5,980.00

Partial Option Listing

8 Quad Slot Backplane Option	\$ 575.00
DLV-11 Serial Interface Unit	\$ 240.00
DLV-11J 4 Port Serial Line Unit	\$ 450.00
DRV-11 Parallel Line Unit	\$ 200.00
KEV-11 Extended Arithmetic Unit	\$ 180.00

4110  
1690  
5800  
165

Partial Software Listing

QJ013AY RT11 Supported	\$2,350.00
QJ013CY RT11 Unsupported	\$1,175.00
QJ813AY Fortran/RT11 Supported	\$ 775.00
QJ813CY Fortran/RT11 Unsupported	\$ 550.00
QJ913AY Basic/RT11 Supported	\$ 750.00
QJ913CY Basic/RT11 Unsupported	\$ 500.00

Terms: Net 30 Days  
FOB: Natick, MA 01760

Discounts apply to units scheduled for delivery  
over a 12 month period, with 1/3 of total number  
of units scheduled for delivery within the first  
six (6) months.

Prices subject to change without notice.

7/9

Charles River Data Systems, Inc.

4 Tech Circle, Natick, Massachusetts 01760  
617-655-1800 TWX: 710 386 0523

**CRDS**



THE BOARD OF DIRECTORS OF THE COMPANY  
HAS APPROVED THE FOLLOWING RESOLUTIONS  
FOR THE ANNUAL MEETING OF THE STOCKHOLDERS  
TO BE HELD AT THE COMPANY'S HEADQUARTERS  
ON THE 15TH DAY OF MAY, 1964, AT 10:00 A.M.  
LOCAL TIME.

RESOLUTION NO. 1  
THAT THE DIVIDEND FOR THE YEAR ENDING  
31ST DECEMBER 1963 BE PAID TO THE  
HOLDERS OF THE COMMON STOCK OF THE  
COMPANY ON THE 15TH DAY OF MAY, 1964  
AT THE RATE OF \$1.00 PER SHARE.

RESOLUTION NO. 2  
THAT THE BOARD OF DIRECTORS BE AND  
IT BE THE DUTY OF THE BOARD OF  
DIRECTORS TO TAKE SUCH ACTION AS MAY  
BE NECESSARY TO CARRY OUT THE  
PURPOSES OF THE ABOVE RESOLUTIONS.

RESOLUTION NO. 3  
THAT THE BOARD OF DIRECTORS BE AND  
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DIRECTORS TO TAKE SUCH ACTION AS MAY  
BE NECESSARY TO CARRY OUT THE  
PURPOSES OF THE ABOVE RESOLUTIONS.

## WARRANTY

CHARLES RIVER DATA SYSTEMS, INC.

All equipment purchased directly from CRDS, it's authorized representatives and/or franchised Distributors is warranted on "return-to-factory" basis against defects in workmanship and materials under normal and proper use in its unmodified condition for a period of ninety (90) days from date of initial shipment. As a condition of this warranty, Customer must (1) obtain a CRDS Return Authorization (RA) number, (b) ship the equipment (or sub-assembly) to the designated CRDS Repair point, transportation prepaid, and (c) include with the returned equipment (or sub-assembly) a WRITTEN description of the claimed defect. Transportation charges for the return to Customer of in-warranty repaired equipment (or sub-assembly) shall be paid by CRDS within the fifty (50) United States, District of Columbia, and Canada. Returns to customer of out-of-warranty repaired equipment (or sub-assembly) shall be "Transportation Collect". If CRDS determines that the equipment (or sub-assembly) returned to it for warranty correction is not defective as herein defined, Customer shall pay CRDS all costs of handling and transportation. All repaired or replaced equipment shall be returned only to Customer and not to third parties to whom Customer may have sold, leased or otherwise transferred the equipment. The warranties provided herein are exclusive to the Customer only.

Charles River Data Systems, Inc., hereby warranties all equipments (or sub-assemblies) of first party manufacturers and/or their authorized, franchised representatives and distributors against defects in workmanship and materials, only to the full limits and extent that such items are warranted to CRDS.







## KD11HA LSI-11/2 MICROPROCESSOR

The 16-bit LSI-11/2 is DEC's standard microprocessor, offering an extensive instruction set, addressing up to 30K words, and automatic priority interrupt structures which simplifies programming. The asynchronous bi-directional bus structure allows for easy addition of peripherals and system configuring.

The LSI-11/2 is by far the most popular and familiar processor in the industry, supplemented by many years of developed software packages.

### NOTE TO USER:

*The LSI-11/23, with yet more advanced features, is directly useable in the MF-211 backplane, and will be offered as soon as available.*

## DUAL FLOPPY DISK SYSTEM

The Shugart SA800 floppy disk drive series consists of read/write electronics, drive mechanism, read/write head, and track positioning mechanism. This ultra-reliable drive system offers soft error rates of one per  $10^9$  bits read, and hard error rates of one per  $10^{12}$  bits read, with MTBF of 5000 POH under heavy usage. The Shugart SA800 series is the industry standard floppy disk system with far more drives in the field than any other flexible disk system.

## ENCLOSURE FEATURES

The MF-211 enclosure is designed for easy access and simplified component replacement. The front panel is easily removable and modules, such as the LSI-11/2, MOS memory card, DLV-11 cards, etc are front panel accessible, plugging directly into the H9270 4-quad slot backplane (or optional 8-quad slot backplane). The backplane card cage can be pivoted upward to allow for easy access to the system's floppy disk drives. In the event of malfunction, any defective sub-assembly can be easily identified, removed and replaced, thus greatly reducing MTTR. Designed into

an attractive enclosure, the MF-211 can be slide-rack mounted or used in table-top applications. Two internally mounted fans provide abundant air cooling.

## MF-211 SYSTEM SPECIFICATIONS

Cabinet dimensions: 10.5"H x 19"W x 22"D

Power consumption: 4 amps (with LSI-11/2 & 32K words)

Operating temperature range: 15°C (59°F) to 32°C (90°F)

Relative humidity: 10% to 80% non-condensing

## LSI-11/2 MICROPROCESSOR

Word size: 16 bits

Addressable memory: Up to 30K words

Number of general registers: 8

## FLOPPY DISK SYSTEM

Storage media: IBM 3740 format 8-bit bytes sector

Single density ..... 128

Double density ..... 256

Sectors/track ..... 26 (1 to 26)

Tracks per diskette ..... 77 (0 to 76)

Format ..... IBM 3740

Command status

Register (RXCS) address ..... 777170

Interrupt vector address ..... 264

Data buffer transfer ..... DMA

## ACCESS TIME AND RATES

Diskette to controller buffer: ..... 32  $\mu$ s/byte (SD);  
16  $\mu$ s/byte (DD)

Buffer to CPU: ..... 16  $\mu$ s/byte

Track to track: ..... 6 ms

Seek settle time: ..... 14 ms

Head load time: ..... 41 ms

Rotational speed: ..... 360 RPM  $\pm$ 2.5%

Average access (25 track seeks and  
rotational latency): ..... 320 ms

### Controller Functions

2901 microprocessor controller allows for total RX02 emulation plus additional intelligent functions.

### Bootstrap Loader

Allows for automatic loading of system diskette on power-up or when Init/Boot switch is activated. The MF-211 bootstrap loader eliminates need for the BDV-11AA boot function, thus saving in both cost and backplane space.

### Single and Double Density Operation

Detailed instructions for use and conversion of single and double density operation are provided in the MF-211 instruction manual provided with each system.

### IBM 3740 Formatter

Using a simple procedure as described in the MF-211 instruction manual, any user can quickly format any diskette with the IBM 3740 headers, a feature not available on the RX02 flexible disk system.

### Self-Diagnostic

The MF-211 self-tester simplifies diskette and system maintenance and diagnosis.

### DMA Data Transfer

Emulating RX02 operation, the MF-211 provides DMA data transfer on a per sector basis.

### Software/Instruction Set Compatibility

Software written for use with the RX02 can be used with the CRDS MF-211 without modification, and with complete interchangeability of diskettes.







## RECORDING TECHNIQUE

Method: ..... FM (SD), MFM modified (DD)  
Maximum bit density: ..... 3200 BPI (SD), 6400 BPI (DD)  
Track density: ..... 48 TPI  
Surfaces: ..... 1

## RELIABILITY

Seek error rate: ..... 1 in  $10^6$  seeks  
Soft read error rate: ..... 1 in  $10^9$  bits  
Hard read error rate: ..... 1 in  $10^{12}$  bits

## SYSTEM TEST PROCEDURE

Each MF-211 system is subjected to a thorough test procedure prior to shipment. The CRDS controller card receives comprehensive in-circuit diagnosis down to the device level via the in-house Test Line 4000 bed-of-nails tester. Each card also is subjected to 48 hours of temperature cycling (10F to 165F). The composite MF-211 system is configured with customer ordered components and receives final test, using appropriate LSI-11 system diagnosis.

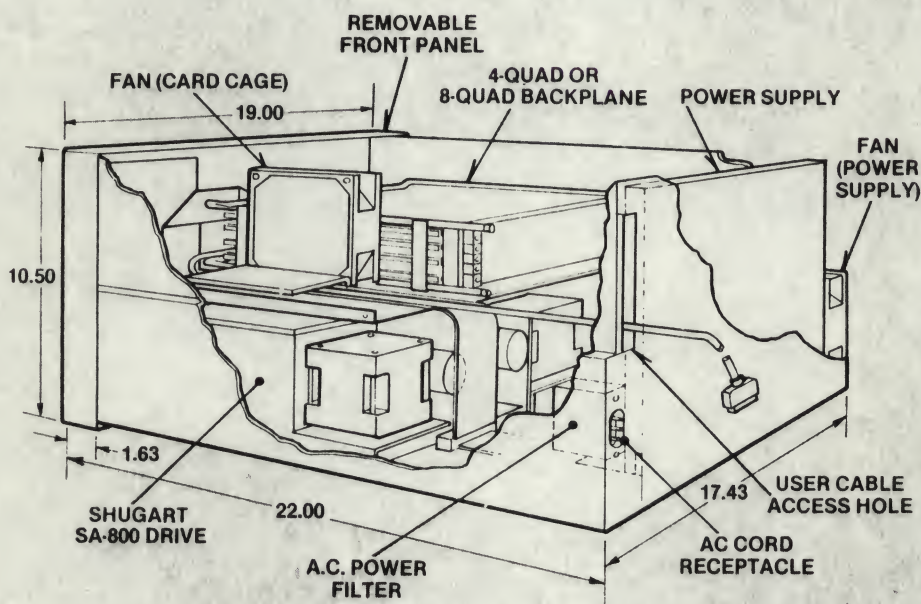
## DOCUMENTATION

An instruction manual is included with each MF-211 system and gives the user all needed information on specifications, installation, system configuration, general operation and preventive maintenance procedures. Detailed procedures are included for:

- Bootstrap loader
- Self-test function
- Creating Dy-based double density diskette from single density diskettes.
- Use of IBM 3740 formatter

The DEC Microcomputer Processors Manual and Memories and Peripherals Manual are also included with each MF-211 system. Additional manuals can be purchased on request.

## LAYOUT DIAGRAM, MF-211 ENCLOSURE



### TO ORDER YOUR MF-211 SYSTEM

simply indicate the needed items below on your order form.

MF-211, with LSI-11/2; and either 16K or 32K words.

- ☐ KEV-11 extended arithmetic unit
- ☐ DLV-11 serial line unit
- ☐ DLV-11J quad serial line unit
- ☐ Cable for serial line unit: RS 232
- ☐ Cable for serial line unit: 20 ma current loop
- ☐ DRV-11 parallel interface
- ☐ Cable for DRV-11
- ☐ Other

Software

- ☐ RT-11
- ☐ Basic/RT11
- ☐ Fortran/RT11
- ☐ Other



# DOCUMENTATION

1. The purpose of this document is to provide a comprehensive overview of the documentation process, including the identification, collection, and preservation of records.

## 1.1 Introduction

1.1.1 The documentation process is a critical component of any organization's information management system. It involves the systematic identification, collection, and preservation of records that are essential for the organization's operations.

## 1.2 Objectives

1.2.1 The primary objective of this document is to define the scope and objectives of the documentation process, ensuring that all relevant records are identified and preserved.

# RECORDING TECHNIQUE

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## SYSTEM TEST PROCEDURE

1. The purpose of this document is to provide a comprehensive overview of the system test procedure, including the identification, collection, and preservation of records.

# FACTORY DIAGRAM WITH END COVER



## FACTORY DIAGRAM WITH END COVER

1. The purpose of this document is to provide a comprehensive overview of the factory diagram with end cover, including the identification, collection, and preservation of records.

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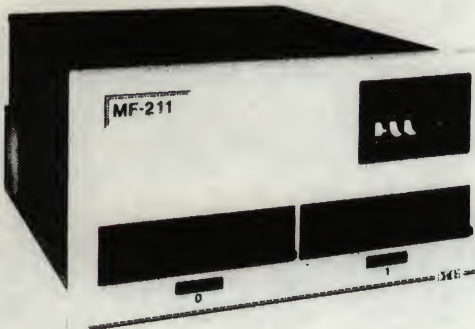


★ In Half the Space ★ Up to 25% Savings ★

# RX02-Compatible Double Density Floppies for the LSI-11/2

## And Have it Your Way

With the LSI-11/2 built-in: The MF-211 Dual Floppy/LSI-11/2 does everything the 11V03-L will do...

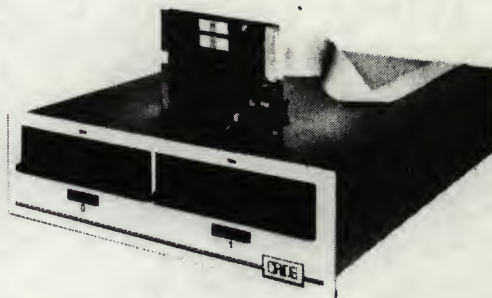


The MF-211 Dual Floppy/LSI-11/2 System, using the CRDS Double Density Controller, is functionally identical to the DEC 11V03-L, but using only 10½" rack space. The MF-211 is the perfect low-cost answer to your 11V03-L requirement.

#### Check These Additional Features:

- Functionally identical to DEC's 11V03-L
- Double and Single Density Operation
- Complete Software/Media Compatibility with LSI-11/2
- Over One Megabyte Storage Per System
- Available with 4 Quad Slot or 8 Quad Slot Backplane
- DEC Software and Interface Cards available as options
- 30K Addressable Memory
- Considerable Dollar Savings

To go with your LSI-11/2: The FD-211 Dual Floppy System is the perfect plug replacement for your RX02...



The FD-211 Double Density Floppy Disk System, using the CRDS Double-Density Controller, is totally software/media compatible with the Digital Equipment RX02 Floppy Disk System. It provides a compact, low-cost and highly reliable solution for all RX02 applications.

#### Check These Additional Features:

- 5¼" Low Profile Chassis
- Dual Shugart Drives
- 512K Bytes Per Drive
- Front Panel Write Protect Switches
- Photocell Write Protect
- Complete Instruction Manual

### Why CRDS Products Give You So Much:

In addition to providing complete RX02 instruction set compatibility, the CRDS floppy disk controller card offers DMA data transfer by sector, bootstrap loader (eliminating need for DEC's REV-11 or BDV-11), IBM 3740 formatter, self-diagnostic, and interface electronics, all contained on a single dual-height card which plugs directly into the H9270 backplane. To design and package sophisticated controller electronics on a single dual-height card is a unique CRDS achievement, unmatched by any other controller supplier in the industry.

- RX02 Double Density and Single Density Operation
- Complete RX02 Software/Media Compatibility with LSI-11/2
- Integral Bootstrap Loader
- Built-In Self-Diagnostic, Formatter
- Dual-Height Controller for LSI-11 or LSI-11/2 Backplane

For more info on our FD-211 and MF-211 Double-Density Floppy Disk Systems, just call or write:

**Charles River Data Systems, Inc.**

4 Tech Circle, Natick, MA 01760 Tel. 617 655-1800 TWX 710 386 0523



CIRCLE 131 ON INQUIRY CARD



in Half the Space \* Up to 25 Savings

# FX02-Compatible Double Density Floppies for the LSI-1/2

And Have it Your Way

Choose from two different diskette formats to match your system's requirements.



The LSI-1/2 is a powerful microcomputer system that can handle a wide range of applications. It's the only system that can handle both 5.25-inch and 8-inch diskettes.

- 5.25-inch diskette format
- 8-inch diskette format
- 5.25-inch diskette format
- 8-inch diskette format
- 5.25-inch diskette format
- 8-inch diskette format

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- 8-inch diskette format
- 5.25-inch diskette format
- 8-inch diskette format
- 5.25-inch diskette format
- 8-inch diskette format

## Why CHS Products Give You Solutions

- We have the only microcomputer system that can handle both 5.25-inch and 8-inch diskettes.
- We have the only microcomputer system that can handle both 5.25-inch and 8-inch diskettes.
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- We have the only microcomputer system that can handle both 5.25-inch and 8-inch diskettes.

For more information, call 1-800-555-1234 or write to CHS Products, Inc., 1234 Main St., Anytown, USA.

CHS Products, Inc.



Circle 10 on Reader Service